

Abstract Submitted
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Giant phonon anomaly associated with strong superconducting fluctuations in the pseudogap phase of underdoped cuprates YE-HUA LIU, Theoretische Physik, ETH Zurich, 8093 Zurich, Switzerland, ROBERT KONIK, Condensed Matter Physics and Material Science Department, Brookhaven National Laboratory, Upton, NY 11973, THOMAS MAURICE RICE, Theoretische Physik, ETH Zurich, 8093 Zurich, Switzerland, FU-CHUN ZHANG, Department of Physics, Zhejiang University, Hangzhou 310027, China — Phonons with wavevectors connecting Fermi-arc ends are strongly damped in the pseudogap phase as $T \rightarrow T_c$ from above. Below T_c the anomaly abruptly switches to a dip in the phonon dispersions at the same wavevectors. Based on our proposed 2-subband model of superconductivity, we analyze the coupling between these phonons and the Leggett mode. We consider the phonon self energy arising from a forward scattering of the phonon accompanied by Cooper-pair transfers between the subbands. The intermediate state of this process involves 2 Leggett modes and a forward scattered phonon. Above T_c , the Leggett mode is overdamped giving rise to the giant phonon damping, while below T_c , the Leggett mode develops a finite energy turning the phonon anomaly into a dip in the energy dispersion.

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